

Tutorials for end of Week 11 / beginning of Week 12

MATH1111: Introduction to Calculus

Semester 1, 2011

Web Page: <http://www.maths.usyd.edu.au/u/UG/JM/MATH1111/>

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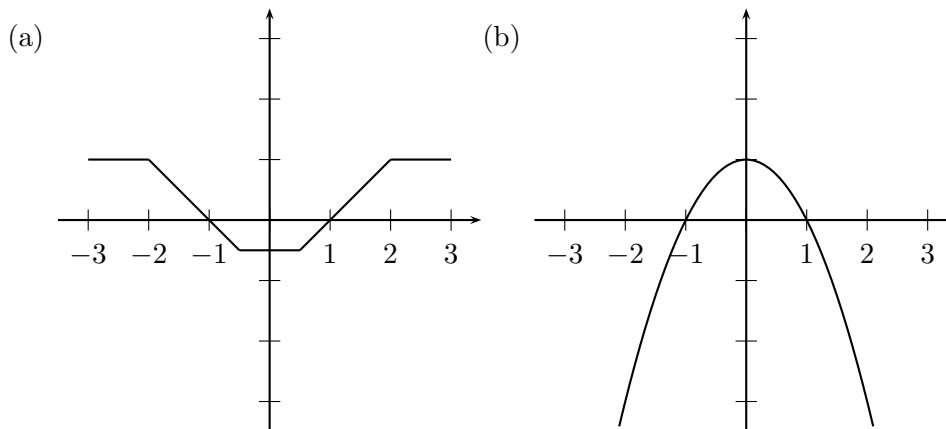
1. Suppose you are given the following facts about the integrals of the functions  $f(x)$  and  $g(x)$ ;

$$\int_0^{10} f(x) dx = 5, \quad \int_0^5 f(x) dx = -1, \quad \int_0^{10} g(x) dx = -3, \quad \int_0^5 2g(x) dx = 6.$$

Calculate the following:

- (a)  $\int_5^{10} f(x) dx$
- (b)  $\int_0^5 g(x) dx$
- (c)  $\int_5^{10} g(x) + f(x) dx$
- (d)  $\int_0^{10} 3f(x) - 2g(x) dx$
- (e)  $\int_{10}^0 f(x) dx$

2. The graph of the derivative of two functions are shown below. On the same set of axes, sketch a possible graph for each function.



3. Find the general anti-derivative of the following functions:

- (a)  $f(x) = 5$
- (b)  $f(x) = x^2$
- (c)  $f(x) = x^3 - 4x^2 + 2x - 1$
- (d)  $f(x) = \sqrt{x}$
- (e)  $f(x) = \frac{x^2 - x}{x^4}$

4. Find the general anti-derivative of the following functions:

- (a)  $f(x) = e^x$
- (b)  $f(x) = \sin x$
- (c)  $f(x) = 2 \cos x - \sin x$

(d)  $f(x) = x^7 + 2e^x - 4 \sin x$

(e)  $f(x) = \frac{1}{x} - x$

5. Find the anti-derivative  $F(x)$  of each of the following functions that satisfies  $F(0) = 0$ :

(a)  $f(x) = 6x$

(b)  $f(x) = e^x$

(c)  $f(x) = x^2 - 4x + \cos x$

(d)  $f(x) = x\sqrt{x} - \frac{1}{\sqrt{x}}$

6. Evaluate the following definite integrals:

(a)  $\int_0^4 x \, dx$

(b)  $\int_{-1}^1 x^2 \, dx$

(c)  $\int_{-2}^3 6x^3 - x^2 \, dx$

(d)  $\int_0^{\frac{\pi}{2}} \cos x \, dx$

(e)  $\int_0^2 2e^x \, dx$

(f)  $\int_{-1}^1 4x^3 \, dx$

(g)  $\int_1^5 \frac{x^3+x+1}{x^2} \, dx$

(h)  $\int_1^{10} \frac{1}{x} \, dx$

7. Calculate the area bound by the  $x$ -axis and the following quadratic polynomials:

(a)  $y = x^2 - 3x + 2$

(b)  $y = x^2 + x - 12$

(c)  $y = -x^2 + 1$

8. (a) Find the derivative of  $F(x) = x \ln x$ .

(b) Hence find a formula for the general anti-derivative of  $f(x) = \ln x$ .